

# Radiation-Hardened Silicon Integrated Low-Loss Nano-Photonic Switches for Array LIDARs, Phase I

Completed Technology Project (2007 - 2007)



## Project Introduction

LIDAR is an innovative technology for the next round of manned exploration of space. The LIDAR instrument transmits light out to a target. The transmitted light interacts with and is changed by the target. Some of this light is scattered back to the instrument where it is analyzed. The change in the properties of the light enables some property of the target to be determined. SMI proposes to develop a  $1 \times 10$  electrically switched silicon nano-optic switch/multiplexer for use with high power lasers in the fiber-based fixed-array laser transmitter for use in NASA planetary explorations. With switch operation proven at greater than 1 GHz switching speed and nearly lossless single-mode waveguides, our device can readily handle high optical power with minimal loss. This switch will allow array LIDAR systems to efficiently share the same laser source. The component is designed in such a way so as to be near seamlessly integrable into present designs so as to dramatically enhance present LIDAR efficiency. The very same fiber optic switch components are radiation-hard -- a feature uniquely suitable for outer space explorations. Further, utilizing our radiation hardened by design techniques developed to deliver a radiation hardened SRAM, we will ensure compatibility with radiation hardened standards. Phase I will see design validation, and Phase II will see the proof-of-concept prototype devices that are delivered to NASA along with radiation testing certification. In Phase III, SMI will commercialize the results of SBIR funded research, by marketing the proposed silicon nano-optic switch/multiplexer to military, space and commercial sectors. In particular, by working with LIDAR system manufacturers serving NASA in Phase II, we will assure seamless acceptance and integration of the SMI switch into one or more LIDAR systems; further, we will also work with NASA system designers to assure our device meets future space system needs as well.



Radiation-Hardened Silicon Integrated Low-Loss Nano-Photonic Switches for Array LIDARs, Phase I

## Table of Contents

Project Introduction	1
Organizational Responsibility	1
Primary U.S. Work Locations and Key Partners	2
Project Management	2
Technology Areas	2

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

### Responsible Program:

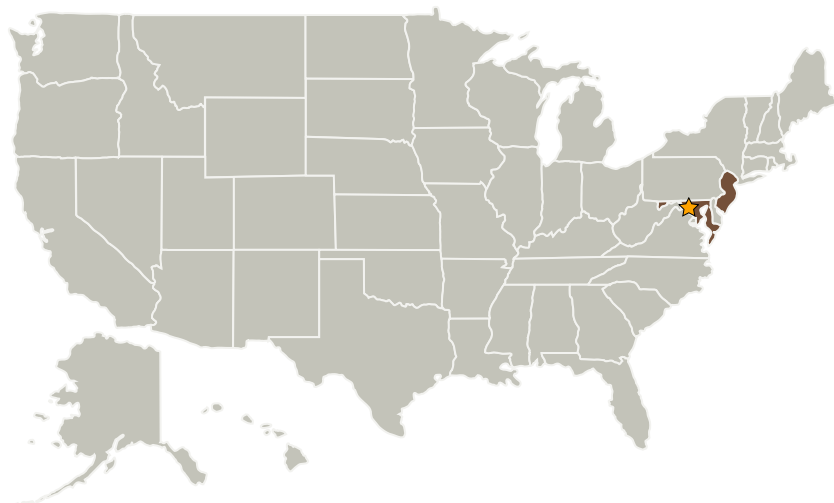
Small Business Innovation Research/Small Business Tech Transfer

## Radiation-Hardened Silicon Integrated Low-Loss Nano-Photonic Switches for Array LIDARs, Phase I

Completed Technology Project (2007 - 2007)



## Primary U.S. Work Locations and Key Partners



## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
  - └ TX08.1.5 Lasers

Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Structured Materials Industries, Inc.	Supporting Organization	Industry	Piscataway, New Jersey

## Primary U.S. Work Locations

Maryland	New Jersey
----------	------------